

AMENDMENTS TO THE DRAWINGS

The attached drawing sheet includes changes to the Figure to more clearly designate the corner edges (5) of the back of the semiconductor element.

Attachment: (1) Replacement Sheet

REMARKS

The specification is amended to indicate that reference numeral (5) in the Figure refers to the corner edges of the back of the semiconductor element. The Figure is also amended to more clearly indicate the corner edges (5) of the back of the semiconductor element. Support for the amendments to the Figure and the specification is found, for example, in the “Summary of the Invention” of the specification which describes that the method wherein chip surfaces are coated with a liquid resin has a problem that the “*corner edge parts of the chip back*” are apt to be incompletely coated and remain exposed (page 2, lines 5-8), which is a problem addressed by the present invention as described at page 3, lines 4-15.

Claims 1 and 2 are amended herein and claim 7 is canceled. Support for the claim amendments is found, for example, at page 1, lines 10-18, which describes that the present invention is directed to a flip chip technique for connecting a semiconductor element to a lead frame, which is a wireless bonding method in which no wires are used; page 4, lines 1-4 which describes that the tackiness of the sheet material is 2 to 15 in terms of ball tack and page 6, lines 21-23, which describes that the term “ball tack” means values obtained by the ball rolling method as provided for in JIS Z 0237; and page 10, lines 15-17 which describes that the back and edges of the flip chip and the bump bonding part are completely sealed with the sheet material.

No new matter is presented.

I. Response to Objection to Drawings

The Examiner has objected to the drawings and the specification as introducing new matter in view of the newly added drawing and the amendments to the specification relating to

the drawing. For example, the Examiner states that the specification as originally filed does not describe, with sufficient specificity, features in the newly added drawing such as that “a back” of the semiconductor element is a different surface than the bump bonding part surface, the drawing shows a plurality of bump bonding parts, that the thermosetting material is in direct contact with the substrate, and that the “edges” of the semiconductor element are distinct surfaces from the “back” of the semiconductor element.

Applicants respectfully traverse the objection to the specification and the new drawings based on the following.

With respect to the Examiner’s statement that the specification as originally filed does not describe that “a back” of the semiconductor element is a different surface than the bump bonding part surface, Applicants submit that the specification clearly describes that typical examples of techniques for connecting a semiconductor to a lead frame include the flip chip method in which a semiconductor element having *bumps formed on the circuit-bearing side* is connected *facedown* to a substrate. Page 1, lines 8-18. Further, the non-circuit side is referred to as the “back”. Page 1 line 24. Also, in the “Summary of the Invention” section of the specification, it is disclosed that the semiconductor device of the present invention includes a flip chip mounted by *face down* bonding. Page 2, line 16. Thus, it is clear from the specification as originally filed that the back of the semiconductor element is a different surface from and opposite to the bump bonding part surface (face or front).

Regarding the Examiner’s statement that the specification as originally filed does not set forth that a plurality of bonding parts can be used, Applicants submit that it has been held that the article “a” means one or more in an open ended claim such as the present claim which recites

“a semiconductor device which *comprises* a semiconductor element mounted through a bump bonding part” It is only in rare circumstances, when there is a clear intent on the patentee that the article “a” can be interpreted as meaning one. See, e.g., *KCJ Corp. v. Kinetic Concepts, Inc.*, 223 F.3d 1351 (Fed. Cir. 2000). Additionally, at page 1 of the specification as originally filed, it is described that typically in the flip chip method, a semiconductor element having *bumps* formed on the circuit-bearing side is connected facedown” Thus, Applicants submit that the Examiner’s interpretation of the description in the specification as not describing a plurality of bonding parts is not correct.

Regarding the Examiner’s statement that the specification as originally filed does not sufficiently describe the thermosetting material being in direct physical contact with the substrate, Applicants refer to page 4, lines 10-15 of the specification where it is disclosed that when the sheet material is press-bonded to the semiconductor element and substrate, a satisfactory adherent state is obtained such that the semiconductor element can be encapsulated in a *void free state*. Also at page 5, lines 2-5, it is disclosed that upon press-bonding, the sheet material can *conform* to the shape of the semiconductor element and encapsulate it *without leaving a space between them*. Thus, this disclosure in the specification as originally filed sets forth the relationship of the thermosetting sheet material being in direct physical contact with the substrate.

With respect to the Examiner’s statement that the specification does not disclose that the “edges of the semiconductor are distinct surfaces from “a back” of the semiconductor as opposed to the edge of a back surface or the apex of a corner position, Applicants submit that the specification describes that the method wherein chip surfaces are coated with a liquid resin has a

problem that the “*corner edge parts of the chip back*” are apt to be incompletely coated and remain exposed (page 2, lines 5-8), which is the problem which the present invention seeks to solve as described at page 3, lines 4-15. In view thereof, the drawing is amended herein to more accurately reflect that reference numeral (5) refers to the “corner edges of the chip back”, thereby obviating this ground for objection.

Accordingly, Applicants respectfully request withdrawal of the objection to the drawings and to the specification.

II. Response to Claim Rejections Under 35 U.S.C. § 112

In paragraph 5, claims 1 and 2 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite regarding the term “tackiness”.

In paragraph 6, claim 7 is rejected under 35 U.S.C. § 112, second paragraph, as being indefinite regarding the lack of units for “ball tack”.

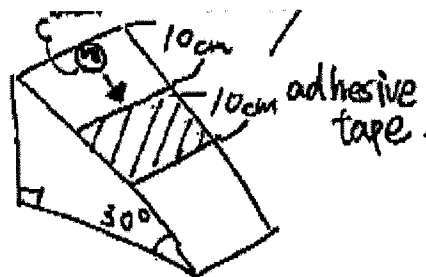
In response to the arguments presented in the Amendment filed December 6, 2007, at paragraph 22 on pages 13-15 of the Action, the Examiner states that the claims are not limited to tackiness as determined by the ball tack method provided for in JIS Z 0237.

Additionally, the Examiner appears to maintain his position that “all” materials have some level of tackiness.

Claims 1 and 2 are amended herein to include a recitation indicating that the sheet material has “tackiness of 2-15 in terms of ball tack obtained by the ball rolling method provided for in JIS Z 0237”, thereby obviating the rejection.

Additionally, Applicants disagree with the Examiner's statements that "all materials have tackiness". JIS Z 0237 shows a ball tack test performed at incline having a slope of 30° as illustrated below. In this test, the runway is adjusted to 10 cm and the adhesive tape having a length of 10 cm is set at the end of the runway. The steel ball (bearing ball) is rolled on the runway having a slope of 30° . Tackiness is then determined by the number of ball having the largest diameter among the balls which are adhered to the tape (adhesive surface). The ball having a larger number has a larger diameter, and therefore, the degree of tackiness can be determined by the ball number. Namely, when the adhesive force (tackiness) of the tape is stronger, a ball having a larger diameter (number) can stop on the adhesive surface. On the other hand, when the adhesive force of the tape is weaker, even a ball having a small diameter can not stop on the adhesive surface, and then the ball falls down.

For example, "a value of the ball tack test is 2" means that when a ball is rolled on the incline, a ball having a size of 2/32 inches (diameter is 1.59 mm) can stop within the region of 10 cm of the adhesive tape.



Although Applicants disagree with the Examiner, Applicants submit that, even if all materials have "some level of tackiness", it is difficult to consider that all materials have a tackiness which can stop the rolling of the ball.

Accordingly, JIS Z 0237 is a test method of the evaluation of tackiness, such as the existence of strong or weak.

Additionally, as shown in Comparative Example 1 of the present application, since a thermosetting sheet is prepared without using a liquid rubber (a liquid polybutadiene-acrylonitrile copolymer), this thermosetting sheet material has no tackiness. Namely, in order to prepare a thermosetting sheet which has tackiness, it is necessary to use a particular kind of material, such as liquid rubber, as shown in the present application.

In view of the above, Applicants' respectfully request withdrawal of the §112, 2nd paragraph rejections.

III. Response to Claim Rejections Under 35 U.S.C. § 102

A. Yamamoto '404

In paragraph 8, claims 1 and 2 are rejected under 35 U.S.C. § 102(b) as being anticipated by Yamamoto ('404).

In response to the arguments presented in the Amendment filed December 6, 2007, the Examiner states that element 9 in Figure 6F of Yamamoto '404 is clearly a "bump bonding part" because it is a bump and "bonds". Also, the Examiner states that the present claims do not sufficiently distinguish this element of the invention from element 9 of Yamamoto '404. Further, with respect to the argument that the encapsulating material of Yamamoto '404 is described as a liquid encapsulating material, the Examiner states that this description refers to element 8 of Yamamoto '404 which was not referred to in the Action.

Applicants respectfully traverse the rejection.

Yamamoto '404 teaches a semiconductor device which comprises a substrate and a semiconductor element mounted thereon *through an adhesive film*, (not a bump bonding part) wherein at least areas where the semiconductor chip terminal and the wiring are connected are encapsulated with a resin. See, e.g., paragraph [0017] and Figures 4 and 6.

The Examiner refers to element 9 in Figure 6, for example, as a bump bonding part; however, this is not correct as it is described at paragraph [0145] that element 9 is wiring. Thus, Yamamoto '404 does not teach all elements of independent claims 1 and 2 and therefore cannot be said to anticipate the claimed invention.

Without conceding the merits of the rejection, claims 1 and 2 are amended to recite a “wire-less bump bonding part” to further distinguish the bump bonding part of the present invention from the “wire” disclosed by Yamamoto '404. As stated in the present specification, the present invention is directed to a flip chip technique for connecting a semiconductor element to a lead frame, which is a wireless bonding method in which no wires are used. See page 1, lines 10-18. Thus, Yamamoto '404 does not disclose all elements of the present invention. For at least this reason the present invention is not anticipated.

Additionally, Applicants submit that the Examiner has not set forth the element of Yamamoto et al which he considers as corresponding to a thermosetting sheet material as recited in present claims 1 and 2. The Examiner does not dispute that element 8 of Yamamoto '404 is a liquid encapsulating material. Neither does the Examiner clearly indicate a different element of Yamamoto '404 that he considers to correspond to a thermosetting sheet material. The only elements of Yamamoto '404 specifically pointed out by the Examiner are 4: a substrate; 6: a semiconductor element; 9: wiring (which the Examiner asserts is a “bump bonding part”); and 3,

which is described as a thermosetting adhesive tape positioned on the top surface of a polyimide film substrate (organic wiring substrate) (see paragraph [0148]), which corresponds to the “circuit-bearing side” opposite to the “back” recited in the present claims. The adhesive tape of Yamamoto ‘404 does not encapsulate a back and edges of the semiconductor element as in the present invention and therefore does not meet the recitation of “the semiconductor element has been encapsulated by coating a back and edges of the semiconductor element with a thermosetting sheet material . . .” Thus, Yamamoto ‘404 does not disclose all elements of the present claims. For these additional reasons, the present claims are not anticipated by Yamamoto ‘404.

Accordingly, Applicants respectfully request withdrawal of the §102 anticipation rejection based Yamamoto ‘404.

B. Hotta ‘096

In paragraph 9, claims 1 and 2 are rejected under 35 U.S.C. § 102(b) as being anticipated by Hotta (‘096)

In response to the arguments presented in the Amendment filed December 6, 2007 that Hotta ‘096 does not disclose teach or suggest encapsulation with a sheet having tackiness, the Examiner asserts that Hotta ‘096 discloses that the sealing resin material is preferably used like a sheet for convenience at column 5, lines 65-66, and the Examiner states that the present claims do not distinguish from the sheet of Hotta ‘096.

Applicants respectfully traverse the rejection.

Hotta '096 does not disclose the sealing resin material having "tackiness". Since a semiconductor device of Hotta '096 has an opening (20), in the case where the sealing resin material forms the sheet, the sealing resin material sheet can be embedded (together with a metal foil) in the opening (and then, they are heated and pressurized). Therefore, it is not necessary to temporarily fix by "tackiness" the sealing resin material. Therefore it is not necessary that the sealing resin material of Hotta '096 has "tackiness".

Additionally, although Example 2 of Hotta '096 discloses the use of a polycarbodiimide composition, the use of liquid rubber is not disclosed in Example 2 of Hotta '096. Therefore, the sheet obtained by Example 2 of Hotta '096 is similar to Comparative Example 1 of the present application. Accordingly, the sheet obtained by Example 2 of Hotta '096 is considered to have no "tackiness".

Further, although the Examiner asserts that the material of Hotta '096 has "high adhesion" (column 5, line 60), this term means that the sealing material of Hotta '096 has an adhesion in the finally-sealed state after heating and pressuring. Therefore, with regard to the "adhesion", Hotta '096 is clearly different from the present invention.

In view of the above, Hotta '096 does not disclose all elements of the present claims and therefore, the present invention is not anticipated.

Accordingly, Applicants respectfully request withdrawal of the anticipation rejection based on Hotta '096.

C. Misumi ‘484

In paragraph 10, claims 1 and 2 are rejected under 35 U.S.C. § 102(b) as being anticipated by Misumi (‘484).

Regarding the argument that Misumi ‘484 does not disclose teach or suggest that the semiconductor element is “encapsulated”, the Examiner takes the position that the present claims do not sufficiently distinguish from Misumi, ‘484 which the Examiner considers to be encapsulated across the entire back surface and edges of the semiconductor element as shown in the Figure at page 17 of the Action.

Without conceding the merits of the rejection, claims 1 and 2 are amended to further define the “encapsulated” semiconductor element. At pages 9-10 of the present specification, a method of encapsulation is disclosed and it is described that the back and edges of the flip chip and the bump bonding part are completely sealed with the sheet material (see page 10, lines 15-17). Thus, claims 1 and 2 are amended to recite that the back and edges of the semiconductor element and bump bonding part are completely sealed by the sheet material. Misumi ‘484 does not disclose, teach or suggest this element of the present claims and therefore the present invention is not anticipated.

Accordingly, Applicants respectfully request withdrawal of the anticipation rejection based on Misumi ‘484.

IV. Response to Claim Rejections Under 35 U.S.C. § 103

A. Yamamoto ‘404 in view of Komoto ‘409

In paragraph 12, claim 6 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Yamamoto ('404) in view of Komoto ('409).

Applicants respectfully traverse the rejection.

The Examiner has not made a *prima facie* showing of obviousness. Specifically, as discussed above, Yamamoto '404 does not teach all elements of the invention and Komoto '409 does not remedy the deficiencies of Yamamoto '404. Specifically, neither of Yamamoto '404 nor Komoto '409 teaches: (1) a substrate and a semiconductor element mounted thereon *through a wire-less bump bonding part*; or (2) that the semiconductor element has been encapsulated by a thermosetting *sheet* material.

As noted above Yamamoto '404 teaches that the semiconductor element is mounted to the substrate via an adhesive film. The Examiner relies on Komoto '409 for the disclosure of a polyimide adhesive film. Thus, even if combined, at best, one of ordinary skill in the art may have been motivated to substitute the polyimide adhesive film of Komoto '409 for the adhesive film of Yamamoto '404, but the presently claimed invention would not have been achieved.

Accordingly, Applicants respectfully request withdrawal of the rejection.

B. Yamamoto '404 in view of Imashiro '711

In paragraph 13, claim 6 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Yamamoto ('404) in view of Imashiro ('711).

Applicants traverse the rejection and submit that the Examiner has not made a *prima facie* showing of obviousness essentially for the same reasons discussed above with respect to the rejection based on Yamamoto '404 in view of Komoto '409. Specifically Imashiro '711 does not remedy the deficiencies of Yamamoto '404 and even if combined, at best one of ordinary

skill in the art would have been motivated to substitute the polyimide adhesive film of Imashiro '711 for the adhesive film of Yamamoto '404, but the presently claimed invention would not have been achieved.

Accordingly, Applicants respectfully request withdrawal of the rejection.

C. Hotta '096 in view of Komoto '409

In paragraph 14, claim 6 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Hotta ('096) in view of Komoto ('409).

As noted above, Hotta '096 merely describes filling an encapsulation resin and does not disclose, teach or suggest encapsulation with a sheet having tackiness. Komoto '409 does not remedy this deficiency. Applicants further submit that there is no motivation to combine the references as suggested by the Examiner with a reasonable expectation of success. Even if combined the present invention would not have been achieved since neither reference teaches or suggests encapsulation with a sheet having tackiness as recited in the present claims.

Accordingly, Applicants respectfully request withdrawal of the rejection.

D. Hotta '096 in view of Imashiro '711

In paragraph 15, claim 6 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Hotta ('096) in view of Imashiro ('711).

As noted above, Hotta '096 merely describes filling an encapsulation resin and does not disclose, teach or suggest encapsulation with a sheet having a tackiness and Imashiro '711 does not remedy this deficiency. Applicants further submit that there is no motivation to combine the references as suggested by the Examiner with a reasonable expectation of success. Even if

combined the present invention would not have been achieved since neither reference teaches or suggests encapsulation with a sheet having tackiness as recited in the present claims.

Accordingly, Applicants respectfully request withdrawal of the rejection.

E. Misumi '484 in view of Komoto '409

In paragraph 16, claim 6 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Misumi ('484) in view of Komoto ('409).

Applicants respectfully traverse the rejection and submit that the Examiner has not made a *prima facie* showing of obviousness. As stated above, Misumi '484 does not disclose, teach or suggest that the semiconductor element is "encapsulated" as required in independent claims 1 and 2 of the present application. Komoto '409 does not remedy this deficiency. Therefore, even if combined, the present invention would have been achieved.

F. Misumi '484 in view of Imashiro '711

In paragraph 17, claim 6 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Misumi ('484) in view of Imashiro ('711).

Applicants traverse the rejection and submit that the Examiner has not made a *prima facie* showing of obviousness essentially for the same reasons discussed above with respect to the rejection based on Misumi '484 in view of Imashiro '711. Specifically Imashiro '711 does not remedy the deficiencies of Misumi '484 and even if combined the presently claimed invention would not have been achieved.

Accordingly, Applicants respectfully request withdrawal of the rejection.

G. Yamamoto '404 in view of Nishikawa '465

In paragraph 18, claim 7 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Yamamoto ('404) in view of Nishikawa ('465).

Claim 7 is canceled herein, thereby rendering the rejection moot.

Accordingly, Applicants respectfully request withdrawal of the rejection.

H. Hotta '096 in view of Nishikawa '465

In paragraph 19, claim 7 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Hotta ('096) in view of Nishikawa ('465).

Claim 7 is canceled herein, thereby rendering the rejection moot.

Accordingly, Applicants respectfully request withdrawal of the rejection.

I. Misumi '484 in view of Nishikawa '465

In paragraph 20, claim 7 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Misumi ('484) in view of Nishikawa ('465).

Claim 7 is canceled herein, thereby rendering the rejection moot.

Accordingly, Applicants respectfully request withdrawal of the rejection.

J. Response to Examiner's Comments

The Examiner maintains the rejections above for the reasons of record and further indicates that the arguments presented in the Amendment filed December 6, 2007 are directed to claims 1 and 2 and therefore are not commensurate in scope with the rejections which are directed to claims 6 and 7. However, Applicants submit that since present claim 6 depends from

claim 1, it requires the elements of claim 1 and the cited references, whether taken alone or in combination, do not disclose, teach or suggest all elements of claim 1. Therefore, claim 6 is distinguished over the art of record for at least the same reasons as claim 1. Claim 7 is canceled herein, thereby rendering the rejection moot.

In view of the above, Applicants respectfully request withdrawal of the obviousness rejections.

V. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

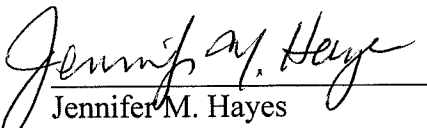
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